Reproducibility and Replicability in Economic Science

Margaret C. Levenstein
University of Michigan
American Economic Association
Is reproducibility a problem in economics?

“Give me a one-handed economist! All my economists say, On the one hand on the other.”

— Harry S. Truman
Evidence of irreproducibility

- Dewald et al, AER 1986
  - Journal of Money, Credit and Banking Project
    - 2/3 of requests for data not successful; most data provided had problems
    - 9 articles re-estimated. 2 replicated
    - Errors in coding, differences in software and data

- McCullough and Vinod, AER 2003
  - More studies that don’t replicate, largely challenges with statistical software

- Duvendack et al, EJW 2015
  - 27 of 333 economics journals regularly share data and code

- Camerer et al, Science 2016
  - Evaluation of experimental results in AER and QJE found 2/3 were replicable

- Cornell team, 2017
  - Despite requirement for sharing, 40% could not be replicated because code failed or data were not available (AEJ: Applied)
  - With no requirement, results are worse: fewer than 10% of authors provided materials necessary for replication on request, despite promise

- Chang and Li, AEA 2018 meetings
  - 67 macroeconomics papers from 13 journals: 49% of results replicated
Efforts to increase reproducibility

• Four journals requiring data sharing in 2003
• AEA changed policy in 2003
  • After publishing McCullough and Vinod article
• 27 journals required sharing in 2015
  • Out of > 300 journals in economics
  • All the most prestigious journals
    • Lower ranked journals afraid that data sharing requirements will discourage submissions
• Professional associations and top-ranked journals critical to changing norms
Efforts to increase reproducibility

- American Economic Association
  - Appointed a data editor to improve and implement practices at all of its nine journals
  - Launching effort to improve access to and reproducibility of research using commercial data
    - Large fraction of articles received waiver under current policy because of restrictions on sharing
      - To protect IP as well as confidentiality
      - Legal prohibitions on sharing or access
        - European privacy regulation likely to require data destruction
  - New initiative joint with ICPSR
Support for replication studies

• 2015: Ten journals encourage publication of replication studies (Duvendack et al.)
• Every journal encourages robustness checks for empirical analyses
• A number of responses to important empirical papers have been published that identify data or computational errors
• Availability of more data, more detailed data, more computational power has transformed economics
  • Allows questioning of results
• Still, very little replication, except as a training exercise
Differences across fields

• Several studies focus on macroeconomics
  • Macroeconomic data tend to be
    • Public
    • Disseminated by statistical agencies or central banks
  • Applied microeconomic studies (labor, education, criminal justice)
    • Rely on confidential administrative data
      • Lots of decisions made to turn admin data into research data
      • Data are often confidential
Resistance to reproducibility

• Takes effort and resources
  • Authors
  • Journals
  • Need repositories that can support re-usable data and code
    • Replicating results in new computing environment introduces another dimension of variation
    • Better yet, code that points to data in certified archives

• Both personal interest and ideological belief
  • IP rights rather than scientific progress
Recommendations

• Commercial data and administrative data
  • Access and versioning
  • Not just open, but safe and FAIR
    • Findable, Accessible, Interoperable and Re-usable
• Give credit for data and code sharing
  • Require data citation as well as data sharing
    • Data and code sharing increases citations
• Technological solutions
  • Storing notebooks with code and data
• Social solutions
  • Learning from mistakes rather than moving on to new topic
  • Acknowledging interaction of theory and empirical analysis in economic estimation
  • Rewarding production and sharing of data as intellectual contribution in tenure and promotion decisions
Questions to address

• Within economics, what is the level of awareness, interest, concern, and involvement in reproducibility and replicability (R&R) of research results?

• Are there specific areas within economics that are more likely to have issues with reproducing scientific results?

• What reproducibility challenges does economics face with cross disciplinary research?